Regional Stormwater Management
A Summary of Policies in Virginia and Maryland

Background

Regional stormwater management is an alternative to on-site controls, in which a watershed wide approach is used to analyze potential water quantity and quality problems and identify appropriate mitigation measurements. The early impetus for regional stormwater management appears to have been obtained from a number of studies conducted in the late 1970's and early 1980's. These studies[1] indicated that, for storms with return periods of less than 5 years, it was not possible to restrict peak flows to their predevelopment levels along downstream major drainageways using on-site detention only[2]. However, the studies also indicated that if soils, groundwater, and site conditions allowed stormwater infiltration on-site, it was possible to meet the wider goal of protecting downstream major drainageways.

In this review, stormwater management (SWM) policies and guidance for the states of Virginia and Maryland, and a number of surrounding counties in these states were examined to determine their approach to regional versus on-site stormwater management. Policies for three Virginia counties (Prince William, Loudoun, and Henrico) and two Maryland counties (Montgomery and Prince George's) were reviewed. The reviews were conducted primarily by keyword searches of official county and state websites. If information on SWM policy could not be found on a state or county website, staff involved in SWM for that state or county was contacted.

State of Virginia

In 1999, the Virginia Department of Conservation and Recreation published the Virginia Stormwater Management Handbook[3] to serve as the primary guidance for SWM programs. According to the Handbook, "*The development of a regional stormwater management plan allows a local government to strategically locate stormwater facilities to provide the most efficient control of localized flooding, stream channel erosion, and water quality*."

The Handbook states that SWM concerns in a given watershed are addressed with greater economy and efficiency by installing facilities based on a regional SWM plan rather than individual, site-specific facilities. The Handbook further notes that while the benefits of regional SWM plans are well documented by localities that have implemented them, adverse impacts are also documented. A list of issues including asserted problems with on-site facilities, asserted benefits of regional facilities, and possible

[1] See, for example: Debo, T. N. 1982. Detention Ordinances – Solving or Causing Problems ? In: *Stormwater Detention Facilities*, American Society of Civil Engineers, New York.
[2] A landmark modeling study (D. F. Lakatos and R. H. Kropp. 1982. Stormwater Detention - Downstream Effects on Peak Flow Rates. In: *Stormwater Detention Facilities*, American Society of Civil Engineers, New York.) showed that locating on-site detention in the lower zone of a watershed may actually result in peak flow increases because flows are held back until upstream peaks arrive.
[3] http://www.dcr.state.va.us/sw/stormwat.htm

adverse consequences that may result from regional facilities is provided. The Handbook suggests that the debate over the merits of regional facilities versus their impacts will be different in each watershed.

Tributary Strategy for Potomac/Shenandoah - does not stipulate specific best management practices for achieving the goals of the Cap Strategy in controlling/reducing the level of nutrients into the Chesapeake Bay. However, indications are that the Interim Cap Strategy (2001) will require jurisdictions first to implement an effective accounting system to track areas that are covered by existing BMPs and second to devise effective methods to retrofit existing developments or provide future controls for areas without controls. A recent assessment of the current (1996) Cap Strategy has indicated that current nutrient reductions are significantly below the levels needed to meet endpoint levels for the Bay by 2010 to avoid a Bay-wide TMDL. In response, the State recently completed an Interim Cap Strategy (2001) to address what further reductions will be necessary. Despite some fundamental issues regarding nutrient load allocations between point (wastewater treatment plants) and non-point sources and jurisdictional allocation, the interim cap strategy will proceed to identify more stringent levels for nutrient reductions. In preparation for this, the County will need to develop and implement BMPs before 2010 on a watershed scale to meet significant reductions or satisfy load allocations countywide, especially in areas not currently controlled by BMPs. Regional BMPs should be one tool considered for this.

State of Maryland

The Maryland Stormwater Design Manual, Volumes I & II[4], published in 2000 by the Maryland Department of the Environment (MDE), serves as the official guide for SWM principles, methods, and practices. MDE has also published a model stormwater management ordinance[5] that provides the minimum content for implementing and enforcing Maryland's stormwater management program consistent with the state code. Both documents do not use the term "regional stormwater management". The documents define "*Off-site stormwater management*" to mean the design and construction of a facility necessary to control stormwater from more than one development.

In general, the Maryland Stormwater Design Manuals and the model stormwater management ordinance do not appear to explicitly encourage regional approaches to SWM. However, the model Stormwater ordinance states that SWM quantitative control waivers shall be granted only to those projects within areas where "*watershed management plans have been developed in accordance with certain conditions, including an assessment of cumulative impacts and a specification of where on-site or off-site quantitative and qualitative stormwater management practices are to be implemented..".* It appears that regional approaches to SWM are recognized as acceptable components of broader watershed management plans.

[4] http://www.mde.state.md.us/environment/wma/stormwatermanual/download_manual.htm
[5] http://www.mde.state.md.us/environment/wma/stormwatermanual/model_ordinance.pdf

Prince William County, Virginia

Prince William County's current SWM policy appears to mirror Fairfax County's SWM policy to a large extent. Section 700 of the Prince William Design and Construction Standards Manual[6], which includes information on policies and regulations related to storm drainage, states:

"The County encourages the construction of regional SWM facilities as opposed to numerous on-site facilities where possible. Regional facilities are generally expected to have drainage areas of one hundred (100) acres (40.47 hectares) or larger and to be located as determined by watershed studies. The Department of Public Works maintains a list of watersheds that have completed watershed management plans. The County will cooperate in the preparation of studies in other watersheds. Developers are encouraged to discuss with the Department of Public Works the possibility of participating in the construction of a regional SWM facility and to share in the benefits of larger Facilities downstream. The Department of Public Works shall provide guidelines for the design, construction, and maintenance of such facilities. The County's objectives for regional SWM facilities are as follows: (1) To encourage a regional approach to storm water detention, rather than numerous small and marginally effective individual on-site ponds; (2) To facilitate the implementation of the regional SWM ponds through the development process; and (3) To reduce the impact on the environment by encouraging the use of nonstructural BMPs, biofilters and sediment forebays. If a regional facility is under construction or funded and scheduled for construction, the properties within the service area of the facility shall be required to participate in the implementation of the regional pond and pay a pro rata share."

Loudoun County, Virginia

All SWM facilities in Loudoun County are privately owned and maintained. For the foreseeable future, it does not appear that the County plans to build publicly owned facilities. The County encourages the incorporation of low-impact development (LID) practices into storm drainage design.

According to Chapter 5 of the Loudoun County Facilities Standards Manual, which deals with water resources management[7], their current overall SWM policy is:
"Adherence to the Virginia Stormwater Management Handbook and the Virginia Erosion and Sediment Control Handbook shall be required. Exceptions shall meet the intent and spirit of the aforementioned handbooks."

The County's general requirements for SWM also include the following about "centralized" and regional facilities:

"Centralized stormwater management facilities shall be incorporated within all proposed developments unless low-impact design is proposed in accordance with the provisions contained in this chapter or alternative measures have prior approval by the Director. Centralized stormwater management facilities shall be sited within the development to

[6] http://www.co.prince-william.va.us/planning/dcsm/dcsm0700.pdf
[7] http://www.co.loudoun.va.us/b&d/docs/facilitiesstand_/chapter5/office2k/office2k.htm

minimize the number of facilities required to serve the property and to maximize the effectiveness of the facilities.

Regional stormwater management is defined as facilities and/or design criteria identified in a County approved drainage district study to control increases in runoff from developed sites within the established district. Stormwater management requirements identified with these studies must be met in conjunction with any applicable land development activity."

Henrico County, Virginia

Henrico County has recently developed and adopted a watershed management program to improve water quality in the County's streams. Prior to the adoption of this approach, water quality goals were met primarily through on-site Best Management Practices (BMPs). In Chapter 2 of the Henrico County Environmental Manual[8], which deals with their stream assessment and watershed management program, it is stated that:

"Although many larger BMPs were determined to be successful in achieving their pollutant removal goal, many small ineffective BMPs were also constructed. In addition, the County's prior approach provided little if any, improvement to degraded stream systems present in the County because the requirements were based on the needs of the site, not the needs of the watershed."

While Henrico County's watershed management program will continue to require effective on-site BMP facilities, the program is expected to reduce the number of ineffective BMPs by providing an alternative approach to address SWM on a watershed level, resulting in more effective facilities. In the past, all regional facilities were privately owned and maintained, with the County responsible for review and approval of BMP construction and administrative tracking of pollutant removal credits. Henrico County's policy on regional SWM and BMP facilities in their watershed program states the following:

"In addition to the privately-owned regional BMPs, the County will begin to develop publicly-owned regional BMPs as part of the Stream Assessment / Watershed Management Program. In order to finance these BMPs, a portion of the Environmental Fund will be set aside each year. It is the County's intent to design and construct publicly owned regional BMPs as funding is accumulated over a five to seven year period. "

Montgomery County, Maryland

Information on specific policies regarding SWM was difficult to obtain from the Montgomery County's website. Staff with responsibility for developing and implementing SWM policies in the County was contacted. Based on information obtained from a personal communication[9], it appears that Montgomery County does not encourage regional approaches to SWM, and in general, on-site controls are implemented. While a number of facilities with relatively large drainage areas exist, these were not constructed

[8] http://www.co.henrico.va.us/works/newdpwweb/chapter2.htm

[9] Dan Harper, Watershed Management Division, Department of Environmental Protection, Montgomery County (240-777-7709)

in accordance with a regional SWM plan. The construction of off-site facilities for SWM is considered only when development conditions and/or space limitations preclude an on-site facility.

Prince George's County, Maryland

Based on a personal communication with staff [10] with responsibility for SWM programs, it appears that Prince George's County policy on SWM is essentially similar to that of Montgomery County. Prince George's County is the developer of the integrated site design approach known as low-impact development (LID). In fact, staff from Prince George's County suggested that on-site facilities based on LID concepts could essentially mitigate any stormwater related water quality and quantity problems.

[10] Derek Winograff, Programs and Planning Division, Department of Environmental Resources, Prince George's County (301-883-5903)

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Stormwater Management Facility Comparison Chart

Note: Staff is in the process of obtaining the information necessary to complete the following chart

	Effective-ness Level Quality Control	Effective-ness Level Quantity Control	Watershed Area served	Capital Cost per imper-vious acre	Maintenance Cost per imp. acre per year	BMP Efficiency Rating per Fairfax County PFM
On-Site Ponds						
Dry	0	3	1-20 ac		308	
Extended Dry	2	3	1-20 ac		338	40
Extended Dry w/sediment trap	3	3				
Extended Dry w/sediment forebay & shallow marsh	3	3	1-20 ac			50
Wet – Design 1, 2.5 * Vr + ext. det.	3	3	3-70 ac		336	45
Wet – Design 2, 4.0 * Vr	3	3	3-70 ac		336	50
Wet – Design 3, sediment forebay & aquatic bench			3-70 ac			65
Regional Ponds						
Dry	0	3	100+ ac		45/31	
Extended Dry	2	3	100+ ac			50
Extended Dry w/sediment trap	3	3	100+ ac			45
Extended Dry w/sediment forebay & shallow marsh	3	3	100+ ac			
Wet – 4 x Vr	3	3	100+ ac		34/117	65
Wet –w/sediment forebay & aquatic bench			100+ ac			
Constructed Wetlands	2	1				30
Underground detention	0	3	<5 ac			0
Rooftop detention	0	2	<1 ac			0
Infiltration Trench						
Design 1, 0.5”/imp. ac.	3	0	<5 ac			50
Design 2, 1.0”/imp. ac.	3	0	<5 ac			
Design 3, 2-yr, 2-hr	3	1	<5 ac			
Design 4, 10-yr	3	3				
Infiltration Basin	3	1	< 50 ac			
Sand Filter						
0.5”/imp. acre	3	0	<3 ac			60

	Effective-ness Level Quality Control	Effective-ness Level Quantity Control	Watershed Area served	Capital Cost per imper-vious acre	Maintenance Cost per imp. acre per year	BMP Efficiency Rating per Fairfax County PFM
Open Space – Conservation Easement	2	0	40% of site			100
Bioretention Basin or Bioretention Filter – Rain Garden						
Design 1 – 0.5" * imp ac						
Design 2 – 1.0" * imp ac	3	0	<2 ac	6500		50
	3	0	<2 ac	7500		65
Green Alley						
	3	1	<1 ac			
Grassed Swale						
	1	1	convey 10yr			15
Water Quality Swale						
	2	1	convey 10yr			35
Vegetated Filter Strip						
	1	0	<2 ac			10
*Rain Barrels						
			<1 ac			
*Rooftop downspout						
	2	0				
*Grassed Roofs						
	2	1	<1 ac			
*Porous Pavement						
	2	1	0.25-10 ac			
Manufactured BMP Systems						
BaySaver						
Downstream Defender	1	0				15
*Filterra	1	0				15
Stormceptor	3	0	<0.25 ac	$24,000		70*
StormFilter	1	0				15
StormTreat	3	0				50
Vortechs	3	0				50
	1	0				15
Stream Restoration						
	1	0				

* Permitted by approved PFM modification

Effectiveness Level

0 – Not at all
1 – Low
2 – Average
3 - High